

# Unit Planning Guide: Grade Algebra 2 Unit 4 of

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| <b>Unit Title:</b> Building and Interpreting Functions | <b>Pacing (Duration of Unit):</b> 3 weeks |
| <b>Grade:</b> Algebra 2                                | <b>Buffer Day(s):</b> 5                   |

## Desired Results

### Transfer Goals (Priority practice standards in **bold**)

*Students will be able to independently use their learning to:*

- MP.1. Make sense of problems and persevere in solving them.
- MP.2. **Reason abstractly and quantitatively.**
- MP.3. **Construct viable arguments and critique the reasoning of others.**
- MP.4. **Model with mathematics.**
- MP.5. Use appropriate tools strategically.
- MP.6. Attend to precision.
- MP.7. **Look for and make use of structure.**
- MP.8. **Look for and express regularity in repeated reasoning.**

### Established Goals (2011 MA Curriculum Frameworks Standards Incorporating the Common Core State Standards)

#### Prerequisite Standards:

- **G-SRT.B.5** Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.
- **G-SRT.C.6** Understand that by similarity, side ratios in right triangles are properties of the angles in the triangle, leading to definitions of trigonometric ratios for acute angles.
- **G-SRT.C.7** Explain and use the relationship between the sine and cosine of complementary angles.
- **G-SRT.C.8** Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.
- **A-REI.B.3** Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.
- **G-CO.A.1** Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc.

#### WIDA for English Language Learners

Standard 1: ELLs **communicate** for **Social** and **Instructional** purposes within the school setting

Standard 3: ELLs **communicate** information, ideas and concepts necessary for academic success in the content area of **Mathematics**

In the lesson planning stage, teachers will need to differentiate lessons for ELLs. In order to accomplish this they will need: 1.) this curriculum map, 2.) a list of their ELLs and their proficiency levels, and 3.) appropriate language function expectations and scaffolds or supports.

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### Standards (Priority Standards in **bold**):

- **F-TF.A.1** Understand radian measure of an angle as the length of the arc on the unit circle subtended by the angle.
- **F-TF.A.2** Explain how the unit circle in the coordinate plane enables the extension of trigonometric functions to all real numbers, interpreted as radian measures of angles traversed counterclockwise around the unit circle.
- **F-TF.A.3** (+) Use special triangles to determine geometrically the values of sine, cosine, tangent for  $\pi/3$ ,  $\pi/4$  and  $\pi/6$ , and use the unit circle to express the values of sine, cosine, and tangent for  $x$ ,  $\pi + x$ , and  $2\pi - x$  in terms of their values for  $x$ , where  $x$  is any real number.
- **F-TF.A.4** (+) Use the unit circle to explain symmetry (odd and even) and periodicity of trigonometric functions.
- **F-TF.B.5** Choose trigonometric functions to model periodic phenomena with specified amplitude, frequency, and midline.
- **F-TF.B.6** (+) Understand that restricting a trigonometric function to a domain on which it is always increasing or always decreasing allows its inverse to be constructed.
- **F-TF.B.7** (+) Use inverse functions to solve trigonometric equations that arise in modeling contexts; evaluate the solutions using technology, and interpret them in terms of the context.
- **F-TF.C.8** Prove the Pythagorean identity  $\sin^2(\theta) + \cos^2(\theta) = 1$  and use it to find  $\sin(\theta)$ ,  $\cos(\theta)$ , or  $\tan(\theta)$  given  $\sin(\theta)$ ,  $\cos(\theta)$ , or  $\tan(\theta)$  and the quadrant of the angle.
- **F-TF.C.9** (+) Prove the addition and subtraction formulas for sine, cosine, and tangent and use them to solve problems.

Meaning (\*Mostly assessed through Performance Tasks/Assessments)

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**Big Ideas:** (Statements and concepts written in teacher friendly language which reflect the important [but not obvious] generalizations we want students to be able to arrive at. These are used by the teacher to focus daily instruction.)

- **Right triangle trigonometry and the Pythagorean Theorem can be used to understand radians, arc lengths, the unit circle, and inverse trig functions.**
- **Trigonometric Functions and their inverses can be used to model many real-world phenomena, can help us to understand patterns and trends (periodic), and can help us predict future outcomes.**

**Essential Questions:** (Questions which frame ongoing and important inquiries about the big ideas. They are written for students and used in daily instruction to help engage students in meaningful thinking.)

- **How do we use trigonometric function to model real world situations?**
- **What types of real world situations can be explained by trigonometric ratios?**

### Acquisition (\*Mostly assessed through traditional summative assessments)

**Knowledge:** Key basic concepts, facts, and key terms (written in phrases) students should be able to recall independently.

*Students will know ...*

- How to convert degrees to radians and vice versa
- The connection between radians and the arc formed
- How to find trig ratios given a right triangle and known angle
- How to draw the unit circle and use it to find common trig ratios for angles such as  $\frac{\pi}{4}$ ,  $\frac{\pi}{2}$ ,  $\pi$ ,  $2\pi$  etc or the angles associated with them
- Make connections between the graphs of trig ratios and the unit circle
- The Pythagorean theorem and its application to trigonometry
- Inverse trig functions
- How to identify different types of trigonometric “curves”
- How to graph trig functions and their inverses

#### Key Academic Vocabulary

- **Radian(s)**
- **Unit Circle**

**Skills:** The discrete skills and process students should be able to use independently.

*Students will be skilled at:*

- Algebraically manipulating the trig functions.
- Identifying the different ratios
- Using the Pythagorean theorem to prove trig identities
- Using trig identities, the Law of Cosines, and Law of Sines to simplify expressions
- Calculating the ratios given a particular angle measure in degrees or radians
- Identifying and drawing the graphs of the sine, cosine, and tangent ratios and their inverses
- Proving trig identities such as the Pythagorean Identity...
- Modeling periodic situations

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| <ul style="list-style-type: none"><li>• Radius, Diameter</li><li>• Tangent &amp; Secant Lines</li><li>• Sine, Cosine, Tangent Ratios</li><li>• Secant, Cosecant, Cotangent Ratios (Reciprocal Ratios)</li><li>• Coratios</li><li>• Inverse Functions</li><li>• Arc &amp; Arc Length</li><li>• Law of Sines &amp; Law of Cosines</li><li>• Amplitude</li><li>• Frequency</li><li>• Midline</li></ul> |  |
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### Resource Suggestions:

- <http://www.nctm.org/>
- <http://www.illustrativemathematics.org/>
- <http://youtube.com/> → Khan Academy
- <http://www.doe.mass.edu/candi/commoncore/>
- <http://map.mathshell.org/materials/stds.php>